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T A B L E S
FOR THE
DETERMINATION OF MINERALS

ARRANGED FOR THE STUDENTS OF THE

SCHOOL OF MINES

OF

COLUMBIA COLLEGE.

BY

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FOURTH EDITION.



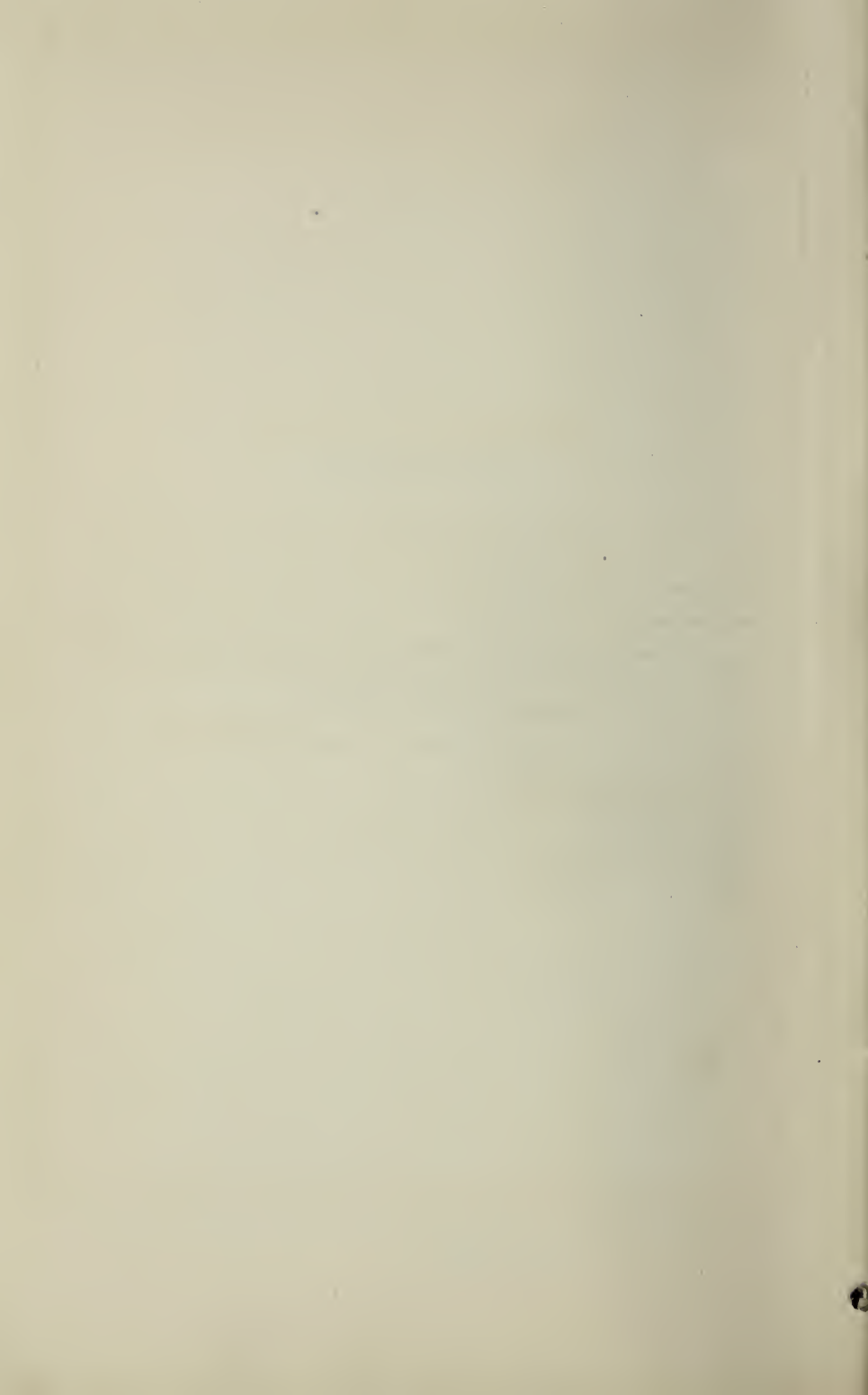
NEW YORK:
1871

Entered, according to Act of Congress, in the year 1870, by
THOMAS EGLESTON,
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STEPHEN ANGELL, PRINTER, 410 FOURTH AVENUE.

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INTRODUCTION.

THE following tables have been arranged for the use of the students of the School of Mines. They have been condensed from the lectures and are intended to familiarize the student with the principal characteristics of minerals, so that by the aid of two or three questions, relating to the operations they would be obliged to perform in the field, a mineral can be determined. They have been used with marked success in the practical study of mineralogy for several years.

T. EGLESTON.

SCHOOL OF MINES, 1871.

CLASSIFICATION OF THE SPECIES

ACCORDING TO

CRYSTALLINE FORM.

ISOMETRIC.

| | | | |
|---------------|-------------------|---------------|---------------|
| Diamond, | Kalinite, | Ullmannite, | Tennantite, |
| Garnet, | Iron, | Sphalerite, | Tetrahedrite, |
| Lapis Lazuli, | Magnetite, | Lead, | Mercury, |
| Hauynite, | Franklinite, | Clausthalite, | Silver, |
| Leucite, | Pyrite, | Arsenolite, | Amalgam, |
| Analcite, | Pharmacosiderite, | Senarmontite, | Argentite, |
| Halite, | Chromite, | Uraninite, | Cerargyrite, |
| Sal Ammoniac, | Alabandite, | Copper, | Bromyrite, |
| Fluorite, | Linnæite, | Cuprite, | Embolite, |
| Boracite, | Smaltite, | Bornite, | Gold, |
| Spinel, | Cobaltite, | | Platinum. |

TETRAGONAL.

| | | | |
|--------------|--------------|--------------|---------------|
| Zircon, | Scheelite, | Stannite, | Wulfenite, |
| Vesuvianite, | Braunite, | Rutile, | Torbernite, |
| Wernerite, | Hausmannite, | Octahedrite, | Chalcopyrite, |
| Apophyllite, | Cassiterite, | Stolzite, | Calomel. |

ORTHORHOMBIC.

| | | | |
|--------------|-------------|---------------|--------------|
| Sulphur, | Staurolite, | Aphthitalite, | Aragonite, |
| Chrysolite, | Calamine, | Thenardite, | Epsomite, |
| Iolite, | Prehnite, | Mascagnite, | Diaspore, |
| Muscovite, | Natrolite, | Barite, | Wavellite, |
| Lepidolite, | Stilbite, | Witherite, | Chrysoberyl, |
| Chondrodite, | Talc, | Celestite, | Goethite. |
| Andalusite, | Serpentine, | Strontianite, | Marcasite, |
| Topaz, | Nitre, | Anhydrite, | Leucopyrite, |

| | | | |
|--|--|--|--|
| Arsenopyrite, Scorodite, Columbite, Wolframite, Pyrolusite, Manganite, Triplite, | Goslarite, Brookite, Bournonite, Anglesite, Cerussite, Bismuthinite, Aikenite, | Orpiment, Valentinite, Stibnite, Autunite, Molybdate, Chalcosite, | Brochantite, Atacamite, Libethenite, Olivenite, Stephanite, Polybasite. |
|--|--|--|--|

MONOCLINIC.

| | | | |
|--|--|--|--|
| Wollastonite, Pyroxene, Spodumene, Petalite, Amphibole, Epidote, Orthoclase, Fibrolite, Euclase, | Datolite, Titanite, Pectolite, Laumontite, Harmotome, Heulandite, Glauberite, Mirabilite, Borax, | Natron, Barytocalcite, Gypsum, Pharmacolite, Alunogen, Melanterite, Vivianite, Bieberite, | Erythrite, Annabergite, Crocoite, Realgar, Kermesite, Liroconite. Malachite, Azurite. |
|--|--|--|--|

TRICLINIC.

| | | | |
|--|-----------------------------|---------------------|----------------------------|
| Sassolite, Rhodonite, Anorthite, | Labradorite, Oligoclase, | Albite, Cyanite, | Cryolite, Chalcanthite. |
|--|-----------------------------|---------------------|----------------------------|

HEXAGONAL.

| | | | |
|---|--|---|---|
| Water, Tellurium, Graphite, Quartz, Beryl, Willemite, Phenacite, Biotite, Nephelite, Tourmaline, Diopase, | Chabazite, Prochlorite, Soda Nitre, Apatite, Calcite, Dolomite, Brucite, Magnesite, Corundum, Alunite, Hematite, | Pyrrhotite, Copiapite, Siderite, Menaccanite, Rhodochrosite, Millerite, Nicolite, Zincite, Smithsonite, Pyromorphite, Mimetite, | Bismuth, Tetradymite, Arsenic, Antimony, Molybdenite, Cinnabar, Proustite, Pyrrargyrite, Iodyrite, Iridosmine. |
|---|--|---|---|

AMORPHOUS.

| | | | |
|--|--|---|---------------------------------------|
| Carbonic Acid, Opal, Chrysocolla, Chlorastrolite, | Sepiolite, Aluminite, Turquois, Limonite, | Arseniosiderite, Psilomelane, Wad, Remingtonite, | Zaratite, Hydrozincite, Minium. |
|--|--|---|---------------------------------------|

CLASSIFICATION OF THE SPECIES

ACCORDING TO

H A R D N E S S .

H. < 1

Carbonic Acid,
Mercury,
Molybdite,
Sassolite,
Water.

H.=0.5-6

Wad.

H.=1-1.5

Cerargyrite,
Embolite,
Iodyrite,
Kermesite,
Molybdenite,
Natron,
Talc.

H.=1-2

Aluminite,
Arsenosiderite,
Bromyrite,
Calomel,
Graphite.

H.=1-2.5

Sulphur.

H.=1.5

Arsenolite,
Brucite,
Copiapite,
Ice,
Lead.

H.=1.5=2

Alunogen,
Gypsum,
Mirabilite,
Orpiment,
Realgar,
Sal-Ammoniac,
Soda-Nitre,
Tetradymite,
Vivianite.

H.=1.5-2.5

Erythrite.

H.=2

Melanterite,
Nitre,
Stibnite.

H.=2-2.25

Epsomite.

H.=2-2.5

Aikinite,
Argentite,
Autunite,
Bismuth,
Bismuthinite,
Borax,
Cinnabar,
Goslarite,
Hydrozincite,
Liroconite,
Mascagnite,
Pharmacolite,
Prochlorite,
Proustite,

Pyrargyrite,
Pyrolusite,
Senarmontite,
Stephanite,
Tellurium,
Thenardite,
Torbernite.

H.=2-3

Chrysocolla,
Kalinite,
Lepidolite,
Minium,
Polybasite.

H.=2.5

Chalcanthite,
Cryolite,
Halite,
Muscovite,
Pharmacosiderite,
Sepiolite.

H.=2.5-2.7

Galenite.

H.=2.5-3

Annabergite,
Bournonite,
Chalcocite,
Clausthalite,
Copper,
Crocoite,
Glauberite,
Gold,
Silver,
Valentinite.

H.=2.5-3.5

Barite,
Calcite.

H.=2.7-2.9

Biotite.

H.=2.7-3

Anglesite,
Wulfenite.

H.=2.75-3

Stolzite.

H.=3

Bornite,
Olivenite,
Serpentine.

H.=3-3.2

Zaratite.

H.=3-3.5

Amalgam,
Anhydrite,
Antimony,
Aphthalite,
Atacamite,
Celestite,
Cerussite,
Millerite.

H.=3-4.5

Tetrahedrite.

H.=3·2-4

Wavellite.

H.=3·5

Arsenic,
Laumontite,
Mimetite.

H.=3·5-3·7

Witherite.

H.=3·5-4

Alabandite,
Alunite,
Aragonite,
Brochantite,
Chalcopyrite,
Cuprite,
Dolomite,
Heulandite,
Malachite,
Pyromorphite,
Scorodite,
Sphalerite,
Stilbite,
Strontianite,
Tennantite.

H.=3·5=4·2

Azurite.

H.=3·5-4·5
Magnesite,
Pyrrhotite,
Rhodochrosite,
Siderite.

H.=4

Barytocalcite,
Fluorite,
Libethenite,
Manganite,
Stannite.

H.=4-4·5

Chabazite,
Platinum,
Zincite.

H.=4-5

Pectolite.

H.=4·5

Iron,
Harmotome.

H.=4·5-5

Apatite,
Apophyllite,
Scheelite,
Wollastonite.

H.=5

Calamine,
Chromite,
Diopase,
Franklinite,
Smithsonite.

H.=5-5·5

Goethite,
Hausmannite,
Leucopyrite,
Limonite,
Natrolite,
Niccolite,
Titanite,
Triplite,
Ullmannite,
Wolframite.

H.=5-6

Amphibole,
Cyanite,
Menaccanite,
Psilomelane,
Pyroxene,
Wernerite.

H.=5-6·5

Hematite.

H.=5·5

Analcite,
Chromite,
Cobaltite,
Datolite,
Lapis Lazuli,
Linnæite,
Uraninite,
Willemite.

H.=5·5-6

Arsenopyrite,
Brookite,
Chlorastrolite,
Häüynite,
Leucite,
Magnetite,
Nephelite,
Octahedrite,
Smaltite.

H.=5·5-6·5

Opal,
Rhodonite.

H.=6

Anorthite,
Columbite,
Labradorite,
Oligoclase,
Orthoclase,
Turquoise.

H.=6-6·5

Albite,
Braunite,
Chondrodite,
Marcasite,
Petalite,
Pyrite,
Rutile.

H.=6-7

Cassiterite,
Fibrolite,

Iridosmine,
Phehnite.

H.=6·5

Epidote,
Vesuvianite.

H.=6·5-7

Chrysolite,
Diaspore,
Garnet,
Spodumene.

H.=7

Boracite,
Quartz.

H.=7-7·5

Iolite,
Staurolite,
Tourmaline.

H.=7·5

Andalusite,
Euclase,
Zircon.

H.=7·5-8

Beryl,
Phenacite.

H.=8

Spinel,
Topaz.

H.=8·5

Chrysoberyl.

H.=9

Corundum.

H.=10

Diamond.

H. undetermined.

Bieberite,
Remingtonite.

CLASSIFICATION OF THE SPECIES

ACCORDING TO

SPECIFIC GRAVITY.

| | | | |
|---|--|--------------------------------------|---|
| G.=0.918—1 | G.=1.9—2.3 | G.=2.35—2.39 | Oligoclase, Pharmacolite, Wernerite. |
| Water. | Opal. | Apophyllite. | |
| G.=1.2—1.6 | G.=2 | G.=2.4 | G.=2.6—2.8 |
| Sepiolite. | Graphite. | Harmotome. | Glauberite, Prochlorite, Talc, Turquois. |
| G.=1.4 | G.=2—2.1 | G.=2.4—2.5 | |
| Mirabilite, Natron. | Chabazite. | Leucite. | |
| G.=1.48 | G.=2—2.2 | G.=2.4—2.8 | G.=2.6—3 |
| Sassolite. | Chrysocolla, Soda-Nitre, Stilbite. | Häüynite. | Phenacite. |
| G.=1.5 | G.=2—2.5 | G.=2.42—2.45 | G.=2.7 |
| Carbonic Acid, Sal-Ammoniac. | Biotite. | Petalite. | Thenardite. |
| G.=1.5—1.8 | G.=2.072 | G.=2.47—2.6 | G.=2.7—2.8 |
| Kalinite. | Sulphur. | Serpentine. | Pectolite. |
| G.=1.6 | G.=2.1—2.2 | G.=2.5—2.6 | G.=2.7—2.9 |
| Aluminite. | Heulandite, Natrolite. | Iolite, Nephelite, Zaratite. | Wollastonite. |
| G.=1.6—1.8 | G.=2.1—2.5 | G.=2.5—2.7 | G.=2.8—2.9 |
| Alunogen. | Halite. | Alunite, Calcite, Quartz. | Anhydrite, Dolomite, Liroconite, Prehnite. |
| G.=1.7 | G.=2.2 | G.=2.53—2.59 | G.=2.8—3 |
| Aphthitalite, Borax, Epsomite, Mascagnite. | Analcite, Chalcanthite. | Orthoclase. | Datolite, Lepidolite, Magnesite. |
| G.=1.8 | G.=2.28—2.41 | G.=2.54—2.64 | G.=2.8—3.1 |
| Melanterite. | Laumontite. | Albite. | Muscovite. |
| G.=1.9 | G.=2.3 | G.=2.6 | G.=2.9 |
| Nitre. | Brucite, Gypsum, Wavellite. | Vivianite. | |
| G.=1.9—2.1 | G.=2.3—2.4 | G.=2.6—2.7 | Aragonite, Boracite, Erythrite. |
| Goslarite. | Lapis Lazuli. | Anorthite, Beryl, Labradorite, | |

G.=2·9—3
Cryolite,
Pharmacosiderite.

G.=2·9—3·4
Amphibole.

G.=3—3·1
Annabergite,
Autunite,
Euclase.

G.=3—3·2
Tourmaline.

G.=3·1
Chondrodite,
Fluorite.

G.=3·1—3·2
Andalusite,
Spodumene.

G.=3·1—3·3
Scorodite.

G.=3·15—4
Garnet.

G.=3·18
Chlorastrolite.

G.=3·2
Fibrolite.

G.=3·2—3·3
Diopase.

G.=3·2—3·5
Pyroxene.

G.=3·25
Apatite.

G.=3·3—3·4
Chrysolite,
Vesuvianite.

G.=3·3—3·5
Diaspore.

G.=3·3—3·7
Titanite.

G.=3·3—4
Epidote.

G.=3·35—3·5
Calamine.

G.=3·4
Orpiment.

G.=3·4—3·6
Realgar,
Rhodonite,
Rhodochrosite.

G.=3·4—3·8
Staurolite,
Triplite.

G.=3·5
Arseniosiderite,
Topaz.

G.=3·5—3·6
Cyanite,
Hydrozincite,
Torbernite.

G.=3·5—3·8
Azurite,
Chrysoberyl.

G.=3·5—4·9
Spinel.

G.=3·55
Diamond.

G.=3·6
Arsenolite,
Barytoalcite,

G.=3·6—3·7
Strontianite.

G.=3·6—3·8
Libethenite.

G.=3·6—4
Limonite.

G.=3·7—3·9
Siderite.

G.=3·7—4
Malachite.

G.=3·7—4·3
Psilomelane.

G.=3·8—3·9
Brochantite,
Octahedrite.

G.=3·8—4·1
Willemite.

G.=3·9—4
Celestite.

G.=4—4·3
Alabandite,
Corundum,
Sphalerite.

G.=4—4·4
Goethite,
Smithsonite.

G.=4—4·5
Bornite.

G.=4—4·7
Zircon.

G.=4—4·8
Barite.

G.=4·1
Brookite.

G.=4·1—4·2
Rutile.

G.=4·1—4·3
Chalcopyrite.

G.=4·1—4·4
Olivenite.

G.=4·2—4·3
Witherite.

G.=4·2—4·4
Manganite.

G.=4·3—4·4
Tennantite.

G.=4·3—4·5
Chromite,
Stannite.

G.=4·4—4·7
Pyrrhotite.

G.=4·4—4·8
Molybdenite.

G.=4·4—5
Bornite.

G.=4·5—4·6
Kermesite,
Stibnite.

G.=4·5—5
Menaccanite.

G.=4·5—5·1
Tetrahedrite.

G.=4·5—5·3
Hematite.

G.=4·6
Minium.

G.=4·6—4·8
Marcasite.

G.=4·7
Hausmannite.

G.=4·7—4·8
Braunite.

G.=4·8—4·9
Pyrolusite.

G.=4·8—5
Linnæite,
Pyrite.

G.=4·9—5·1
Magnetite.

G.=5·2—5·3
Senarmontite.

G.=5·2—5·6
Millerite.

| | | | |
|---|---|-------------------|---|
| G.=5·3—5·8 | G.=6 | G.=6·4—7 | G.=8·9 |
| Embolite. | Scheelite. | Smaltite. | Cinnabar, Copper. |
| G.=5·4—5·5 | G.=6—6·3 | G.=6·5—7 | G.=9·7 |
| Proustite. | Cobaltite. | Pyromorphite. | Bismuth. |
| G.=5·4—5·8 | G.=6—6·1 | G.=6·6—6·7 | G.=10—11 |
| Zincite. | Arsenopyrite. | Antimony. | Amalgam. |
| G.=5·4—6·4 | G.=6·1—6·3 | G.=7—8·7 | G.=1·01—11·1 |
| Columbite. | Tellurium. | Leucopyrite. | Silver. |
| G.=5·5 | G.=6·1—6·8 | G.=7—8·8 | G.=11·4 |
| Cerargyrite, Iodyrite, Valentinite. | Aikinite. | Clausthalite. | Lead. |
| G.=5·5—5·8 | G.=6·2 | G.=7·1—7·2 | G.=13·5 |
| Chalcocite. | Anglesite, Polyasite, Stephanite. | Mimetite. | Mercury. |
| G.=5·5—6·5 | G.=6·2—6·5 | G.=7·1—7·3 | G.=15—19 |
| Franklinite. | Ullmannite. | Argentite. | Gold. |
| G.=5·7—5·9 | G.=6·3—6·9 | G.=7·1—7·5 | G.=16—19 |
| Bourbonite, Pyrargyrite. | Wulfenite. | Wolframite. | Platinum. |
| G.=5·8—6 | G.=6·3—7·1 | G.=7·2—7·7 | G.=19—21 |
| Bromyrite, Cuprite. | Cassiterite. | Galenite. | Iridosmine. |
| G.=5·9 | G.=6·4 | G.=7·2—8·4 | <i>Undetermined.</i> |
| Arsenic. | Calomel, Cerussite, Uraninite. | Tetradymite. | Bieberite, Copiapite, Molybdite, Remingtonite, Wad. |
| G.=5·9—6·1 | G.=6·4—6·5 | G.=7·3—7·6 | |
| Crocoite. | Bismuthinite. | Nicolite. | |
| | | G.=7·3—7·8 | |
| | | Iron. | |
| | | G.=7·8—8·1 | |
| | | Stolzite. | |

CLASSIFICATION OF THE SPECIES.

SYSTEMATIC ARRANGEMENT.

| | | | |
|--------------------------|---------------------------|---------------------------|--------------------------|
| Hydrogen. | <i>Phenacite Group.</i> | III. Subsilicates. | Stilbite, |
| Water. page 1 | Willemite, | Chondrodite, | Heulandite. |
| Sulphur. | Phenacite, p. 3 | Tourmaline, | MARGAROPHYLLITE SECTION. |
| Sulphur. | <i>Garnet Group.</i> | Andalusite, | I. Bisilicates. |
| Tellurium. | Garnet. | Fibrolite, | <i>Talc Group.</i> |
| Tellurium. | <i>Vesuvianite Group.</i> | Cyanite, ↙ | Talc. |
| Carbon. | Zircon, | Topaz, ↙ | <i>Sepiolite Group.</i> |
| Diamond, | Vesuvianite. | Euclase, | Sepiolite. |
| Graphite, | <i>Epidote Group.</i> | Datolite, | II. Unisilicates. |
| Carbonic Acid. | Epidote. | Titanite, p. 6 | <i>Serpentine Group.</i> |
| Boron. | <i>Iolite Group.</i> | Staurolite. | Serpentine. p. 8 |
| Sassolite. | Iolite. | HYDROUS SILICATES. | III. Subsilicates. |
| Silicon. | <i>Mica Group.</i> | I. Bisilicates. | <i>Chlorite Group.</i> |
| <i>Oxygen Compounds.</i> | Biotite, | <i>Pectolite Group.</i> | Prochlorite. |
| Quartz, | Muscovite, | Pectolite, | Potassium. |
| Opal. | Lepidolite. | Laumontite. | Nitre, |
| SILICATES. | <i>Scapolite Group.</i> | <i>Dioptase Group.</i> | Aphthitalite. |
| ANHYDROUS SILICATES. | Wernerite, p. 4 | Dioptase, | Sodium. |
| I. Bisilicates. | <i>Nephelite Group.</i> | Chrysocolla. | Soda Nitre, |
| <i>Amphibole Group.</i> | Nephelite. | II. Unisilicates. | Thenardite, |
| Wollastonite, p. 2 | <i>Leucite Group.</i> | <i>Calamine Group.</i> | Glauberite, |
| PYROXENE, | Lapis Lazuli, | Calamine, | Mirabilite, |
| Rhodonite, | Hauynite, | Prehnite, | Halite, |
| Spodumene, | Leucite. | Chlorastrolite. | Borax, p. 9 |
| Petalite, | <i>Feldspar Group.</i> | <i>Apophyllite Group.</i> | Natron. |
| Amphibole. | Anorthite, | Apophyllite. p. 7 | Ammonium. |
| <i>Beryl Group.</i> | Labradorite, | ZEOLITE SECTION. | Mascagnite, |
| Beryl. | Oligoclase, | I. Unisilicates. | Sal Ammoniac. |
| II. Unisilicates. | Albite, | Natrolite. | Barium. |
| <i>Chrysolite Group.</i> | Orthoclase, p. 5 | II. Bisilicates. | Barite, |
| Chrysolite. | | Analcite, | Witherite, |
| | | Chabazite, | Barytocalcite. |
| | | Harmotome, | |

Strontium.

Celestite,
Strontianite.

Calcium.

Anhydrite, p. 10
Gypsum,
Fluorite,
Apatite,
Pharmacolite,
Aragonite,
Calcite,
Dolomite,
Scheelite.

Magnesium.

Brucite, p. 11
Epsomite,
Boracite,
Magnesite,
Spinel.

Aluminium.

Corundum,
Diaspore,
Aluminite,
Alunogen,
Alunite, p. 12
Kalinite,
Cryolite,
Turquoise,
Wavellite,
Chrysoberyl.

Iron.

Iron,
Magnetite,
Franklinite,
Hematite, p. 13
Goethite,
Limonite,
Pyrrhotite,
Pyrite,
Marcasite,
Melanterite,
Copiapite,
Vivianite,

Leucopyrite, p. 14
Arsenopyrite,
Scorodite,
Pharmacosiderite,
Arseniosiderite,
Siderite,
Menaccanite,
Chromite,
Columbite,
Wolframite. p. 15

Manganese.

Braunite,
Hausmannite,
Pyrolusite,
Manganite,
Psilomelane,
Wad,
Alabandite,
Triplite,
Rhodochrosite, p. 16

Cobalt.

Linnaeite,
Bieberite,
Smaltite,
Cobaltite,
Erythrite,
Remingtonite,

Nickel.

Millerite,
Niccolite,
Ullmannite, p. 17
Annabergite,
Zaratite.

Zinc.

Zincite,
Sphalerite,
Goslarite,
Smithsonite,
Hydrozincite.

Tin.

Cassiterite,
Stannite. p. 18

Titanium.

Rutile,
Octahedrite,
Brookite.

Lead.

Lead,
Minium,
Galenite,
Bournonite,
Anglesite,
Clausthalite,
Pyromorphite, p. 19
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Polybasite,
Cerargyrite,
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Gold.

Platinum.

Platinum.

Iridium.

Iridosmine.

SYSTEMS OF CRYSTALLIZATION.

| NO. | SIMPLE FORMS. | AXES. |
|-----|---|---|
| 1 | Octahedron, or cube. | 3 axes rectangular and equal. |
| 2 | Tetragonal pyramid, or right prism with a square base. | 3 axes rectangular, 2 equal. |
| 3 | Rhombic pyramid, or right prism with a rhombic base. | 3 axes rectangular, and unequal. |
| 4 | Monoclinic pyramid, or inclined rhombic prism. | 3 axes unequal, 2 rectangular. |
| 5 | Triclinic pyramid, or doubly inclined rhomboidal prism. | 3 axes unequal, and unequally inclined. |
| 6 | Hexagonal pyramid, hexagonal prism, or rhombohedron. | 4 axes, 3 equal and equally inclined, 1 at right angles to the other three. |

NAMES USED BY DIFFERENT AUTHORS.

| NO. | MOHS. | WEISS & ROSE. | PHILLIPS. | NAUMANN. | DELAFOSSÉ. | DANA. 1854. | DANA. 1869. |
|-----|----------------|------------------|---------------|------------------|---------------|----------------|----------------|
| 1 | Tessular. | Regular. | Cubic. | Tesseral. | Cubic. | Monometric. | Isometric. |
| 2 | Pyramidal. | 2 and 1 axial. | Pyramidal. | Tetragonal. | Tetragonal. | Dimetric. | Tetragonal. |
| 3 | Orthotype. | 1 and 1 axial. | Prismatic. | Rhombic. | Orthorhombic. | Trimetric. | Orthorhombic. |
| 4 | Hemiorthotype. | 2 & 1 membered. | Oblique. | Monoclinohedric. | Clinorhombic. | Monoclinic. | Monoclinic. |
| 5 | Anorthotype. | 1 & 1 membered. | Anorthic. | Triclinohedric. | Clinohedric. | Triclinic. | Triclinic. |
| 6 | Rhombohedral. | 3 and 1 axial. | Rhombohedral. | Hexagonal. | Hexagonal. | Hexagonal. | Hexagonal. |

SCALE OF HARDNESS.

- 1.—Talc. Laminated light green variety. Easily scratched by the nail.
- 2.—Gypsum. Crystallized variety. Not easily scratched by the nail. Does not scratch a copper coin.
- 3.—Calcite. Transparent variety. Scratches and is scratched by a copper coin.
- 4.—Fluor. Crystalline variety. Not scratched by a copper coin. Does not scratch glass.
- 5.—Apatite. Transparent variety. Scratches glass with difficulty. Easily scratched by the knife.
- 5.5.—Scapolite. Crystalline variety.
- 6.—Orthoclase. White cleavable variety. Scratches glass easily. Not easily scratched by the knife.
- 7.—Quartz. Transparent variety. Not scratched by the knife. Yields with difficulty to the file.
- 8.—Topaz. Transparent variety. Harder than flint.
- 9.—Sapphire. Cleavable varieties. Harder than flint.
- 10.—Diamond. Harder than flint.

VON KOBEL'S SCALE OF FUSIBILITY.

| | | |
|---|-----------------------|--|
| 1 | Stibnite. | Fusible in coarse splinters in the flame of a candle. |
| 2 | Natrolite. | Fusible in thin splinters in the flame of a candle ; easily fused in coarse fragments before the blowpipe. |
| 3 | Almandite. Garnet. | Infusible in the flame of a candle, fusible in coarse fragments before the blowpipe. |
| 4 | Actinolite. | Fusible in thin splinters before the blowpipe. |
| 5 | Orthoclase. | Fusible with difficulty in thin splinters. |
| 6 | Bronzite. | Only rounded on the edges in very fine splinters. |

| Name of the Species. | Primitive Form. | Cleavage. | Fracture. | Specific Gravity | Hardness. | Luster. | Streak. | Colors and Physical Properties. | Action of Acids. | Blowpipe Characters |
|----------------------|-----------------------------------|---|-------------|------------------|------------|------------------------------------|--|---|----------------------------------|---|
| Water, | Hexagonal Prism. | Parallel to the base. | Conchoidal. | 1 | 1.5 | Vitreous. | White. | Colorless, greenish, and bluish in large masses. | | Becomes liquid at 0°, boils at 100°. |
| Sulphur, | Rt. Rhombic Prism of 101° 47' | Imperfect Parallel to the Prism and Octahedron. | Conchoidal. | 2.072 | 1 to 2.5 | Resinous. Vitreous and adamantine. | Sulphur yellow. Sometimes reddish or greenish. | Yellow when transparent. Double refracting. | Not acted on. | When pure volatilizes without residue, giving off sulphurous acid. |
| Tellurium, | Hexagonal Prism. | Parallel to the Prism. | Lamellar. | 6.1 to 6.3 | 2 to 2.5 | Metallic. | Tin white. | Tin white. | | On charcoal burns with green flame; volatilizes leaving a white ring with a red border. |
| Diamond, | Octahedron. | Parallel to the faces of the Octahedron. | Conchoidal. | 3.55 | 10 | Brilliant adamantine. | | Colorless, smoky, yellow, green, blue & black. | Not acted on. | Burns without residue before the oxyhydrogen blowpipe. |
| Graphite, | Hexagonal Prism. | Parallel to the base of the Prism. | Lamellar. | 2 | 1 to 2 | Metallic. | Black and lustrous. | Steel gray. | Not acted on. | Infusible. Burns slowly in O. F. |
| Carbonic Acid. | | | | 1.5 | -1 | | | Colorless. | | |
| Sassolite, | Doubly inclined Prism of 118° 30' | Parallel to the base. | Lamellar. | 1.48 | -1 | Pearly. | White. | White. | Soluble in water. | Fuses in the flame of a candle. |
| Quartz, | Rhombic prism of 94° 15' | Difficult parallel to the faces of the Rhombic prism. | Conchoidal. | 2.5 to 2.7 | 7 | Vitreous and resinous. | White if pure. If impure, often of the same color as the impurity. | Colorless, white, black, red, green, double refracting. | Not acted on. | Infusible. Soluble in Carbonate of Soda. |
| Opal, | | | Conchoidal. | 1.9 to 2.3 | 5.5 to 6.5 | Vitreous and resinous. | White. | White-yellow, red, brown, green, gray. | More or less completely soluble. | Infusible. Gives off water and becomes opaque. |

| Name of the Species. | Primitive Form. | Cleavage. | Fracture. | Specific Gravity | Hardness. | Luster. | Streak. | Colors and Physical Properties. | Action of Acids. | Blowpipe Characters. |
|----------------------|--|--|-----------------------------------|------------------|------------|-----------------------------|-------------------------------------|--|---------------------------------------|---|
| Wollastonite, | Inclined Rhombic Prism of 95°35' | Parallel to the base. | Uneven. | 2.7 to 2.9 | 4.5 to 5 | Vitreous and pearly. | White or same as color. | White, gray, yellow, red, brown. | Gelatinizes. | Phosphorescent when heated on chcl. Fuses easily on the edges to a semi-transparent glass. Swells with Soda in excess and is infusible. |
| Pyroxene, | Inclined Rhombic Prism of 87°5' | Parallel to the Prism & base. | Conchoidal or uneven. | 3.2 to 3.5 | 5 to 6 | Vitreous, resinous, pearly. | White or gray, or paler than color. | White through green to black. | Some varieties are slightly acted on. | Fuses more or less readily to a bead. Some varieties fuse only on the edges. |
| Rhodonite, | Doubly Inclined Rhomboidal Prism of 73°48' | More or less difficult. Parallel to the faces of the Prism. | Uneven. | 3.4 to 3.6 | 5.5 to 6.5 | Vitreous and pearly. | Reddish white. | Red, rose, brown. | More or less completely dissolved. | Fusible to a black bead in O. F. |
| Spodumene | Inclined Rhombic Prism of 87° | Parallel to the Ortho Pinacoid. | Uneven. | 3.1 to 3.2 | 6.5 to 7 | Pearly and vitreous | White. | White, gray, green, reddish | Not acted on. | Looses color, intumesces fuses to a bead. Reaction for Lithia. |
| Petalite, | Inclined Rhombic Prism of 86°20' | Perfect parallel to the base. Easy parallel to clinodome. | Imperfectly conchoidal and scaly. | 2.42 to 2.45 | 6 to 6.5 | Vitreous. | White. | Milk white, white tinted gray, red or green. | Not acted on. | Melts on the edges. Gives the reaction for Lithia, sometimes the reaction for Fl. |
| Amphibole, | Inclined Rhombic Prism of 124°11' | Parallel to the Prism. | Conchoidal or uneven. | 2.9 to 3.4 | 5 to 6 | Vitreous, pearly, silky. | White or paler than color. | White through green to black | Some varieties are slightly acted on. | Fuses to a glass darker than the specimen. |
| Beryl, | Hexagonal Prism. | Easy Parallel to the base. Difficult Parallel to Prism. | Conchoidal or uneven. | 2.6 to 2.7 | 7.5 to 8 | Vitreous. | White. | Green, blue, yellow, red, white. | Not acted on. | Fusible with difficulty on the edges. |
| Chrysolite, | Right Rhomb. Prism of 119°13' | Easy Parallel to the macro Pinacoid. Traces Parallel to Br'chly Pinac. | Conchoidal. | 3.3 to 3.4 | 6.5 to 7 | Vitreous. | White. | Green, yellow brown. Double Refracting. | Gelatinizes. | Infusible. |
| Willemite, | Rhombohedral Prism and Pinacoid. | Parallel to Hexagonal Prism and Pinacoid. | Conchoidal and Imperfect. | 3.8 to 4.1 | 5.5 | Vitreous and resinous. | White. | Colorless, white yellow, brown, grayish blk. Dble. refract'g | Gelatinizes. | Becomes opaque & fuses with difficulty on the edges. |

DETERMINATIVE MINERALOGY.

| Name of the Species. | Primitive Form. | Cleavage. | Fracture. | Specific Gravity | Luster. | Streak. | Colors and Physical Properties. | Action of Acids. | Blowpipe Characters. |
|----------------------|-----------------------------------|--|-------------------------|------------------|---|--------------------------------|--|--|--|
| Phenacite, | Rhombohedron, 116° 36' | Indistinct. | Conchoidal and uneven. | 2.6 to 3 | Vitreous. | Colorless. | Colorless, yellow, brown fracting. | Insoluble. | Infusible. |
| Garnet, | Rhombic Dodecahedron. | Dodecahedral Generally indistinct. | Subconchoidal, uneven. | 3.15 to 4 | Vitreous or resinous. | Colorless. | Red, brown, yellow, white, green, black. | Imperfectly soluble. | Most varieties fuse readily. |
| Zircon, | Right Square Prism. | Parallel to Prism and Octahedron. | Conchoidal, uneven. | 4 to 4.7 | Vitreous. | Colorless. | Colorless, red, brown, yellow, pink, green. Double refracting. | Insoluble. | Infusible. |
| Vesuvianite | Right Square Prism. | Parallel to both Prisms. | Imperfectly conchoidal. | 3.3 to 3.4 | Vitreous or resinous. | White. | Green, brown, yellow, red, blue. Dichroic. | Partially soluble in HCl. Gelatinizes after calcination. | Intumesces and fuses easily. |
| Epidote, | Inclined Rhombic Prism of 69° 56' | Easy Parallel to the base. | Uneven. | 3.3 to 4 | Vitreous and pearly on the easy fracture. | Colorless, grayish or reddish. | Green, yellow, brown, black. | Gelatinizes after calcination. | Intumesces and fuses to a dark bead. |
| Iolite, | Right Rhombic Prism of 119° 10' | Easy Paral. to Macro, & diff. paral. to Brachy Pinacoid. | Conchoidal. | 2.5 to 2.6 | Vitreous | Colorless. | Blue, green, yellow, gray, and brown. Pleochroic. | Partially acted on. | Fusible with difficulty. |
| Biotite, | Hexagonal. | Parallel to the base. | Lamellar. | 2 to 2.5 | Vitreous. | White or gray | White, gray, brown, red, green, black. | Decomposed by S. | Fusible with difficulty. |
| Muscovite, | Right Rhombic Prism near 120° | Parallel to the base. | Lamellar. | 2.8 to 3.1 | Vitreous. | White or gray | White, gray, brown, green, black. | Insoluble. | Fusible with difficulty. |
| Lepidolite, | Right Rhombic Prism of 120° 30' | Parallel to the base. | Lamellar. | 2.8 to 3 | Pearly or vitreous. | White. | White, green, red, gray, violet. | Partially attacked by acids. | Fuses easily, gives the reaction for Li. |

| Name of the Species. | Primitive Form. | Cleavage. | Fracture. | Specific Gravity | Hardness. | Luster. | Streak. | Colors and Physical Properties. | Action of Acids. | Blowpipe Characters. |
|----------------------|--|--|--|------------------|-----------|---|---------------|---|--|---|
| Wernerite, | Right Square Prism. | Parallel to both Prisms. | Uneven. | 2.6 to 2.7 | 5 to 6 | Vitreous or pearly on the fracture. | Colorless. | White, gray, yellow, green, blue and red. | Partially soluble in H Cl. | Fuses easily with intumescence. |
| Nephelite, | Hexagonal Prism. | Imperfect Parallel to the base and prism. | Conchoidal to the base and unequal. | 2.5 to 2.6 | 5.5 to 6 | Vitreous or resinous | Colorless. | Gray, white. | Gelatinizes. | Melts with difficulty. |
| Lapis Lazuli, | Rhombic Dodecahedron. | Parallel to the Rhombic Dodecahedron. | Uneven | 2.3 to 2.4 | 5.5 | Vitreous or dull. | Clear blue. | Blue. | Gelatinizes with HCl and gives off HS. | Melts easily with intumescence to a white glass. |
| Haüynite, | Rhombic Dodecahedron. | Parallel to the Rhombic Dodecahedron. | Conchoidal, unequal. | 2.4 to 2.8 | 5.5 to 6 | Vitreous. | Bluish white. | Blue. | Gelatinizes. | Fuses on the edges to a white glass. |
| Leucite, | Tetragonal Tris-Octahedron. | Parallel to the Rhombic Dodecahedron. | Conchoidal and unequal. | 2.4 to 2.5 | 5.5 to 6 | Vitreous or resinous. | Colorless. | White, gray, red. | Completely soluble, but does not gelatinize. | Infusible. |
| Anorthite, | Doubly inclined Rhomboidal Prism of 120° 37' | Parallel to the base. | Conchoidal. | 2.6 to 2.7 | 6 | Vitreous or pearly. | Colorless. | Colorless, white. | Soluble and deposits pulverulent silica. | Fusible on the edges. |
| Labradorite | Doubly inclined Rhomboidal Prism of 121° 37' | Parallel to the base. | Imperfectly conchoidal, uneven, scaly. | 2.6 to 2.7 | 6 | Vitreous on the faces, pearly on the fracture. | Colorless. | Gray, yellow, red, blue, with play of colors. | Imperfectly soluble. | Fuses with difficulty to a bead. |
| Oligoclase, | Doubly inclined Rhomboidal Prism of 120° 42' | Parallel to the base. | Conchoidal, uneven, scaly. | 2.6 to 2.7 | 6 | Vitreous or pearly on the cleavage, pearly on the fracture. | Colorless. | White, green, red. | Insoluble. | Melts with difficulty. Colors the flame yellow. |
| Albite, | Doubly inclined Rhomboidal Prism of 120° 47' | Easy parallel to the base. Less easy parallel to prism | Imperfectly conchoidal, uneven. | 2.54 to 2.64 | 6 to 6.5 | Vitreous, pearly on base & sometimes on the prism. | Colorless. | Colorless, pale red, yellow, green, gray. | Insoluble. | Melts easily on the edges. Colors the flame yellow. |

| Name of the Species. | Primitive Form. | Cleavage. | Fracture. | Specific Gravity | Hardness. | Luster. | Streak. | Colors and Physical Properties. | Action of Acids. | Blowpipe Characters. |
|----------------------|---|--|-------------------------------|------------------|-----------|-------------------------------|-----------------------------|--|--|--|
| Orthoclase, | Inclined Rhombic Prism of 118° 43' | Ea. paral. to base. Less en. & very often interrupted paral. to prism | Conchoidal or unequal. | 2.53 to 2.59 | 6 | Vitreous, pearly on the base. | Colorless. | Colorless, white, rose, red, brown, yellow, green. | Not acted on. | Melts with difficulty on the edges. |
| Chondrodite, | Right Rhomb. Prism of 49° 59' | Indistinct. | Conchoidal. | 3.1 | 6 to 6.5 | Resinous. | White, reddish or greenish. | Yellow, brown, red, green, gray. | Gelatinizes. | Infusible. Reaction for Fl. |
| Tourmaline | Rhombohedral of 139° 8' | Imperfect parallel to the Rhomb and Prism. | Conchoidal, and uneven. | 3.0 to 3.2 | 7 to 7.5 | Vitreous. | Colorless. | Colorless, gray, red, blue, brown, yellow black. | Not acted on. | Some varieties fuse easily, others with difficulty and give the reaction for B ₂ O ₃ . |
| Andalusite, | Right Rhombic Prism of 90° 44' | Perf. paral. to the prism. Imperf. paral. to the Macro and Brachy Pinac. | Conchoidal, scaly, or uneven. | 3.1 to 3.2 | 7.5 | Vitreous | White. | Green, red, gray, brown. From Brazil, shows Polychroism. | Not acted on. | Infusible. |
| Fibrolite, | Inclined Rhombic Prism of 97° | Parallel to the Ortho-Pinacoid. | Uneven. | 3.2 | 6 to 7 | Vitreous. | Colorless. | Gray or brown. Dichroous. | Not acted on. | Infusible. |
| Cyanite, | Doubly inclined Rhombic Prism of 106° 13' | Three Cleavages, one of which is easy the others less so. | Uneven. | 3.5 to 3.6 | 5 to 6 | Pearly and vitreous. | Colorless. | Colorless, white, blue, green, gray, black. | Not acted on by HCl only, partially by SO ₃ | Infusible. |
| Topaz, | Right Rhombic Prism of 124° 17' | Perf. paral. to base. Imperf. paral. to the Macro & Brachy-domes. | Conchoidal or uneven. | 3.5 | 8 | Vitreous. | Colorless. | Colorless, yellow, red, greenish blue. Pyroelectric. | Not acted on. | Infusible. Reaction for Fl. |
| Euclase, | Inclined Rhombic Prism of 140° 40' | Very easy parallel to the Prism. | Conchoidal. | 3.0 to 3.1 | 7.5 | Vitreous or pearly. | Colorless. | Colorless, green, blue. Electric by friction. | Not acted on. | Swells and melts with difficulty on the edges to a white enamel. |
| Datolite, | Inclined Rhombic Prism of 76° 38' | Easy Parallel to the Ortho-Pinacoid. | Uneven or conchoidal. | 2.8 to 3 | 5.5 | Vitreous. | White. | Colorless, white, green, gray, violet, red or yellow. | Gelatinizes. | Swells and melts easily to a clear glass. Gives the reaction for Boracic Acid. |

| Name of the Species. | Primitive Form. | Cleavage. | Fracture. | Specific Gravity | Hardness. | Luster. | Streak. | Colors and Physical Properties. | Action of Acids. | Blowpipe Characters. |
|----------------------|------------------------------------|--|---------------------------------|------------------|-----------|-------------------------------------|-----------------|---|--|---|
| Titanite, | Inclined Rhombic Prism of 113° 31' | Easy parallel to the Prism. | Imperfectly conchoidal, uneven. | 3.3 to 3.7 | 5 to 5.5 | Adamantine or vitreous. | White or red. | White, yellow red, brown, green, gray, Pleichroism. Pyroelectric. | In fine powder HCl imperfectly. S' completely. Partly acted on by S. | Melts with intumescence to a dark glass. |
| Staurolite, | Right Rhombic Prism of 129° 26' | Perf. parallel to the Macro-Pinacoid. Imperf. parallel to the Prism. | Conchoidal or uneven. | 3.4 to 3.8 | 7 to 7.5 | Vitreous or resinous. | White. | Dark red, reddish brown, black. | | Infusible. |
| Pectolite, | Inclined Rhombic Prism. | Easy parallel to the Prism. | Fibrous. | 2.7 to 2.8 | 4 to 5 | Pearly and silky on the fracture. | White. | White, gray, brown. | Gelatinizes with HCl. | Melts easily to a white enamel. |
| Laumontite | Inclined Rhombic Prism of 86° 16' | Easy parallel to the Prism. | Uneven. | 2.28 to 2.41 | 3.5 | Vitreous or pearly on the cleavage. | White. | White, yellow gray, red. Exfoliates in the air, losing water. | Gelatinizes with HCl. | Intumesces and melts to a white glass. |
| Diopside, | Rhombic-hedron of 95° 55' | Parallel to the Rhombic-hedron. | Conchoidal or uneven. | 3.2 to 3.3 | 5 | Vitreous or resinous. | Emerald green. | Emerald green. | Gelatinizes. | Infusible, becomes black in the oxidizing flame, and red in the reducing flame. |
| Chryso-colla, | Amorphous. | | Conchoidal. | 2 to 2.2 | 2 to 3 | Resinous. | Greenish white. | Green, blue, brown, black. | Decomposed without gelatinizing. | Colors the flame green, but is infusible. |
| Calamine, | Rt. Rhombic Prism of 104° 13' | Easy parallel to the Prism. Less easy parallel to base. | Conchoidal or uneven. | 3.35 to 3.50 | 5 | Vitreous, adamantine, pearly. | White. | Colorless, white, gray, yellow, brown, green, blue, Pyroelectric. | Gelatinizes. | Swells, gives a slight flame with a green lustre, melts with great difficulty on the edges. |
| Prelmite, | Rt. Rhombic Prism of 94° 56' | Easy parallel to base, more difficult parallel to the Prism. | Uneven. | 2.8 to 2.9 | 6 to 7 | Vitreous or pearly. | Colorless. | White, gray, green, Pyroelectric. | Decomposed without gelatinizing. | Swells, exfoliates, and melts easily to a white or yellow glass. |
| Chlorastro-lite. | Amorphous. | | Fibrous. | 3.18 | 5.5 to 6 | Pearly in the fracture. | White. | Bluish green. | Soluble with flocculent silica. | Intumesces and melts to a greenish glass. |

| Name of the Species. | Primitive Form. | Cleavage. | Fracture. | Specific Gravity. | Hardness. | Luster. | Streak. | Colors and Physical Properties. | Action of Acids. | Blowpipe Characters. |
|----------------------|------------------------------------|---|-----------------------------------|-------------------|-----------|--|-------------------------------|--|--|---|
| Apophyllite, | Right Square Prism. | Very easy parallel to the base. | Conchoidal or uneven. | 2.35 to 2.39 | 4.5 to 5 | Vitreous, pearly on the base. | White. | Colorless, gray, yellow, blue, rose, pale green. | Decomposed leaving slimy silica. | Exfoliates, intumesces, and melts to a white enamel. |
| Natrolite, | Right Rhomb. Prism of 91°. | Easy parallel to the Prism. | Uneven or conchoidal. | 2.1 to 2.2 | 5 to 5.5 | Vitreous. | Colorless. | Colorless, white, gray, red or green. | Soluble with gelatinous silica. | Fuses quietly to a colorless glass. |
| Analcite, | Cube. | Imperfect parallel to the faces of the Cube. | Uneven or conchoidal. | 2.2 | 5.5 | Vitreous or pearly. | White. | Colorless, white, gray, blue, green, red. | Soluble with separation of gelatinous silica. | Fuses easily to a colorless glass. |
| Chabazite, | Rhomb. hedron of 91° 46' | Parallel to the Rhomb. hedron. | Uneven. | 2 to 2.1 | 4 to 4.5 | Vitreous | White. | Colorless, white, red, yellow. | Soluble with separation of slimy silica. | Intumesces and melts easily to a bleby glass. |
| Harmotome, | Inclined Rhombic Prism of 124° 47' | Parallel to the base and the Prism. | Uneven or imperfectly conchoidal. | 2.4 | 4.5 | Vitreous. | White. | Colorless, white, gray, brown and red. | Soluble with pulverulent silica. | Becomes friable, and then melts with difficulty on the edges. |
| Stilbite, | Rt. Rhombic Prism of 94° 16' | Easy parallel to the Macro and Brachy-Pinacoids. | Uneven. | 2 to 2.2 | 3.5 to 4 | Vitreous, pearly on the Macro-Pinacoid. | White. | White, red, yellow, brown. | Soluble with pulverulent silica. | Swells and melts easily to a white enamel. |
| Heulandite, | Inclined Rhombic Prism of 138° 14' | Easy parallel to the Clinopinacoid. | Uneven or imperfectly conchoidal. | 2.1 to 2.2 | 3.5 to 4 | Vitreous or pearly on the Clinopinacoid. | White. | White, gray, yellow, brown red. | Soluble with pulverulent silica. | Swells and melts to a white enamel. |
| Talc, | Rt. Rhombic Prism near 120° | Easy Parallel to the base, difficult parallel to the Prism. | Scaly or earthy. | 2.6 to 2.8 | 1 to 1.5 | Pearly on the cleavage planes. | White, or lighter than color. | Blue, green, gray, white. | Partly acted on after long ebullition in concentrated acids. | Exfoliates and melts with difficulty on the edges. |
| Sepiolite, | Compact or earthy. | Earthy. | Earthy. | 1.2 to 1.6 | 2.5 | Dull. | White. | White, gray, or reddish. | Soluble with gelatinous silica. | Becomes black and then white, and melts with difficulty on the edges. |

| Name of the Species. | Primitive Form. | Cleavage. | Fracture. | Specific Gravity | Hardness. | Luster. | Streak. | Colors and Physical Properties. | Action of Acids. | Blowpipe Characters. |
|----------------------|---|--|-------------------------|------------------|------------|-----------------------|-----------------|--|---|---|
| Serpentine, | Rt. Rhombic Prism? Crystals generally pseudomorphs. | | Conchoidal or Lamellar. | 2.47 to 2.60 | 3 | Resinous. | White. | Green, yellow, red. | In powder decomposed in HCl and S. | Becomes white and melts with difficulty on the edges. |
| Prochlorite | Rhombohedral prism of 65° 28' | Very easy parallel to the base. Trace parallel to the Prism. | Lamellar. | 2.6 to 2.8 | 2 to 2.5 | Vitreous or pearly. | Slightly green. | Green, brown, yellow. | In powder decomposed in strong S. | Exfoliates, becomes white, and melts with difficulty to a gray glass. |
| Nitre, | Rt. Rhombic Prism of 118° 50' | Parallel to the Prism. | Conchoidal. | 1.9 | 2 | Vitreous or resinous. | White. | White. | Soluble in water. | Deflagrates. |
| Aphthitalite, | Rt. Rhombic Prism of 120° 30' | Difficult parallel to the Prism. | Fibrous or uneven. | 1.7 | 3 to 3.5 | Vitreous or resinous. | White. | White, bluish or greenish. | Soluble in water. | Fuses without intumescing. |
| Soda-Nitre, | Rhombohedral prism of 106° 33' | Parallel to the Rhombohedron. | Imperfectly conchoidal. | 2 to 2.2 | 1.5 to 2 | Vitreous. | White. | White, brown, gray, yellow. Double Refracting. | Deliquesces. Soluble in water. | Deflagrates. |
| Thenardite, | Rt. Rhombic Prism of 125° 55' | Parallel to the base and the Prism. | Uneven. | 2.7 | 2 to 2.5 | Vitreous. | White. | White. | Soluble in water. | Colors the flame yellow and fuses. |
| Glauberite, | Inclined Rhombic Prism of 83° | Easy Parallel to the base. | Conchoidal. | 2.6 to 2.8 | 2.5 to 3 | Vitreous. | White. | Yellow or gray. | Partially dissolved in water. Falls to pieces after long exposure | Decrepitates and melts on Ch. to a clear glass. |
| Mirabilite, | Inclined Rhombic Prism of 86° 31' | Parallel to the Ortho-Pinacoid. | Uneven. | 1.4 | 1.5 to 2.0 | Vitreous. | White. | White. | Soluble in water. | Fusible. |
| Halite, | Cube. | Parallel to the faces of the Cube. | Conchoidal. | 2.1 to 2.5 | 2.5 | Vitreous. | White. | Colorless, white, yellow, blue, red, purple. | Soluble in water. | Generally decrepitates and then fuses. |

| Name of the Species. | Primitive Form. | Cleavage. | Fracture. | Specific Gravity. | Hardness. | Luster. | Streak. | Colors and Physical Properties | Action of Acids. | Blowpipe Characters. |
|----------------------|-----------------------------------|---------------------------------------|------------------------------------|-------------------|------------|--------------------------------|---------|--|---|---|
| Borax, | Inclined Rhombic Prism of 87° | Parallel to the Ortho-Prism. | Conchoidal. | 1.7 | 2 to 2.5 | Vitreous or resinous. | White. | White, gray, or blue. | Soluble in water. | Swells and melts to a transparent glass. |
| Natron, | Inclined Rhombic Prism of 76°28' | Parallel to the base. | Earthy. | 1.4 | 1 to 1.5 | Vitreous. | White. | White, gray, yellow. | Soluble in water. Effervesces with acids. | Swells and melts. |
| Mascagnite, | Rt. Rhombic Prism of 107°40' | Parallel to the base and Brachy-Dome. | Earthy or uneven. | 1.7 | 2 to 2.5 | Vitreous. | White. | Gray, yellow. | Soluble in water. | If pure volatilizes completely. |
| Sal-Ammoniac, | Cube. | Parallel to the Octahedron. | Uneven. | 1.5 | 1.5 to 2 | Vitreous. | White. | White, gray, or yellow. | Soluble in water. | If pure volatilizes completely. |
| Barite, | Rt. Rhombic Prism of 101°40' | Perfect Parallel to the base. | Uneven. | 4 to 4.8 | 2.5 to 3.5 | Vitreous, resinous, or pearly. | White. | White, yellow, gray, blue, red or brown. | Insoluble. | Decrepitates and is fusible with difficulty on the edges. |
| Witherite, | Rt. Rhombic Prism of 113°30' | Parallel to the Prism. | Uneven. | 4.2 to 4.3 | 3.5 to 3.7 | Vitreous or resinous. | White. | White, yellow, gray, or grayish. | Soluble with effervescence. | Decrepitates and melts to a transparent globule which becomes white on cooling. |
| Barytocalcite, | Inclined Rhombic Prism of 106°34' | Parallel to the Prism. | Uneven. | 3.6 | 4 | Vitreous or resinous. | White. | White, gray, green, yellow. | Soluble with effervescence. | Decrepitates and fuses with difficulty and colors the flame yellowish-green. |
| Celestite, | Rt. Rhombic Prism of 104°2' | Parallel to the base & Prism. | Imperfectly conchoidal, or uneven. | 3.9 | 3 to 3.5 | Vitreous or pearly. | White. | White or faintly bluish or reddish. | Insoluble. | Decrepitates and fuses with difficulty. Gives St. reaction. |
| Strontianite, | Eight Rhombic Prism of 117°19' | Parallel to the Prism. | Uneven. | 3.6 to 3.7 | 3.5 to 4 | Vitreous or resinous. | White. | Green, white, gray, yellow, brown. | Soluble with effervescence. | Melts on the edges and swells. Gives St. reaction. |

| Name of the Species. | Primitive Form. | Cleavage. | Fracture. | Specific Gravity. | Hardness. | Luster. | Streak. | Colors and Physical Properties. | Action of Acids. | Blowpipe Characters. |
|----------------------|--|--|-----------------------|-------------------|------------|-------------------------|----------------|--|---|---|
| Anhydrite, | Rt. Rhombic Prism of $102^{\circ}56'$ | Parallel to the base and the Macro-Pinacoid. | Uneven. | 2.8 to 2.9 | 3 to 3.5 | Vitreous or pearly. | Grayish white. | White, grayish, bluish, reddish. | Slightly soluble in H ₂ O. | Whitens, does not exfoliate, becomes covered with a white enamel. |
| Gypsum, | Inclined Rhombic Prism of $188^{\circ}23'$ | Parallel to the Cline-Pinacoid. | Uneven. | 2.3 | 1.5 to 2 | Pearly or vitreous. | White. | White, gray, yellow, blue, red, black, brown. | Soluble in 4 to 500 parts of water. | Fuses at 2.5 to 3. |
| Fluorite, | Octahedron. | Parallel to the Octahedron. | Conchoidal or uneven. | 3.1 | 4 | Vitreous. | White. | White, yellow, green, blue, red, brown. | Gives the reaction for F ₂ with S. | Decrepitates and fuses to a white enamel. |
| Apatite, | Hexagonal Prism. | Imperfect parallel to the base. | Conchoidal or uneven. | 3.25 | 4.5 to 5 | Vitreous or resinous. | White. | Colorless, green, blue, violet, red, gray, brown. | Dissolves in HCl & in N ₂ O. | Fusible with difficulty on the edges. |
| Pharmacolite, | Inclined Rhombic Prism of $111^{\circ}6'$ | Parallel to the Cline-Pinacoid. | Uneven. | 2.6 to 2.7 | 2 to 2.5 | Vitreous. | White. | White, gray, or red. | Soluble in acids. Insoluble in water. | Fuses to a white enamel and gives the odor of As. |
| Aragonite, | Rt. Rhombic Prism of $116^{\circ}10'$ | Parallel to the Macro-Pinacoid. | Conchoidal or uneven. | 2.9 | 3.5 to 4 | Vitreous or resinous. | White. | Colorless, green, yellow, gray, violet. | Soluble with effervescence | Loses \bar{C} and falls to powder. |
| Calcite, | Rhomb, of $105^{\circ}5'$ | Parallel to the Rhomb. | Conchoidal. | 2.5 to 2.7 | 2.5 to 3.5 | Vitreous or earthy. | White or gray. | White, gray, green, yellow, red, black. Double refracting. | Soluble with effervescence | Infusible. Loses \bar{C} and becomes incandescent. |
| Dolomite, | Rhomb, of $106^{\circ}3'$ | Parallel to the Rhomb. | Conchoidal or uneven. | 2.8 to 2.9 | 3.5 to 4 | Vitreous or pearly. | White or gray. | White, gray, red, green, brown, yellow, black. | Slowly soluble. | Infusible. Loses \bar{C} . |
| Scheelite, | Eight Square Prism. | Parallel to the Octahedron. | Uneven. | 6 | 4.5 to 5 | Vitreous or adamantine. | Whits. | White, yellow, brown. | Soluble, leaving a yellow powder. | In thin splinters fuses on the edges. |

| Name of the Species, | Primitive Form. | Cleavage. | Fracture. | Specific Gravity. | Hardness. | Luster. | Streak. | Colors and Physical Properties. | Action of Acids. | Blowpipe Characters. |
|----------------------|-----------------------------|---------------------------------------|-----------------------|-------------------|------------|---|---------|---|---|--|
| Brucite, | Rhombohedron of 82°15' | Parallel to the base. | Uneven. | 2.3 | 1.5 | Pearly. | White. | White, gray, blue, green. | Soluble. | Infusible. Becomes opaque and friable. |
| Epsomite, | Rt. Rhombic Prism of 90°34' | Parallel to the Brachy Pina-coid. | Uneven. | 1.7 | 2.25 | Vitreous, silky or earthy. | White. | White. | Soluble in water. | Loses water and fuses. |
| Boracite, | Cube. | Difficult parallel to the Octahedron. | Conchoidal or uneven. | 2.9 | 7 | Vitreous or adamantine. | White. | White, gray, yellow, red, green. Pyroelectric. | Soluble when in powder. | Intumesces and fuses to a glass which is white on cooling. |
| Magnesite, | Rhombohedron of 107°39' | Parallel to the Rhombohedron. | Conchoidal or flat. | 2.8 to 3 | 3.5 to 4.5 | Vitreous or silky. | White. | White, yellow, brown. | Dissolves slowly. | Gives a bright light, loses C, and is infusible. |
| Spinel, | Octahedron. | Parallel to the Octahedron. | Conchoidal. | 3.5 to 4.9 | 8 | Vitreous or dull. | White. | Red, blue, green, yellow, gray, white, brown, black. | Insoluble in HCl. Partially soluble in "S." | Infusible, but changes color. |
| Corundum, | Hexagonal Prism. | Parallel to the base. | Conchoidal or uneven. | 3.9 to 4 | 9 | Vitreous pearly. In twin crystals often opalescent. | White. | Colorless, blue, red, yellow, gray, brown. | Insoluble. | Infusible. |
| Diaspore, | Rt. Rhombic Prism of 83°32' | Parallel to the Macro-Pina-coid. | Uneven. | 3.3 to 3.5 | 6.5 to 7 | Vitreous, brilliant or pearly on the cleavage. | White. | Colorless, green, violet, blue, red. Shows Polychroism. | Insoluble. | Infusible. |
| Aluminite, | Botryoidal. | | Earthy. | 1.6 | 1 to 2 | Dull earthy. | White. | White. | Soluble. | Fuses with difficulty. |
| Alumogen, | Inclined Rhombic Prism. | | Uneven. | 1.6 to 1.8 | 1.5 to 2 | Vitreous or silky. | White. | White, yellow, red. | Soluble in water. | Intumesces and fuses. |

| Name of the Species. | Primitive Form. | Cleavage. | Fracture. | Specific Gravity. | Hardness. | Luster. | Streak. | Colors and Physical Properties. | Action of Acids. | Blowpipe Characters. |
|----------------------|-------------------------------|-----------------------------------|-----------------------|-------------------|-----------|-------------------------------|----------------|---|-----------------------------------|---|
| Alumite, | Rhombohedron of 89° 10' | Parallel to the base. | Conchoidal or flat. | 2.5 to 2.7 | 3.5 to 4 | Vitreous or pearly. | White. | White, gray or red. | Soluble when pulverized. | Decrepitates and is infusible. |
| Kalinite, | Octahedron. | Parallel to the Octahedron. | Conchoidal or uneven. | 1.5 to 1.8 | 2 to 3 | Vitreous. | White. | White or brown. | Soluble in water. | Swells and forms a spongy mass. |
| Cryolite, | Oblique Rhombohedral Prism. | Parallel to the base. | Uneven. | 2.9 to 3 | 2.5 | Vitreous or pearly. | White. | White, red or brown. | Soluble in S. | Fuses in the flame of a candle. |
| Turquoise, | Botryoidal and uniaxionated. | | Conchoidal. | 2.6 to 2.8 | 6 | Waxy or dull. | White. | Blue. | Soluble. | Infusible. |
| Wavellite, | Rt. Rhombic Prism of 126° 25' | Parallel to the Prism. | Uneven. | 2.3 | 3.2 to 4 | Vitreous, pearly or resinous. | White. | White, yellow, green, gray, brown, black. | With S gives off HFL. | Infusible. |
| Chrysoberyl, | Rt. Rhombic Prism of 119° 46' | Parallel to the Brachy Prismatic. | Conchoidal or uneven. | 3.5 to 3.8 | 8.5 | Vitreous. | White. | Green. Dichroic. | Insoluble. | Infusible. |
| Iron, | Cube. | Parallel to the Octahedron. | Hackly. | 7.3 to 7.8 | 4.5 | Metallic. | Gray. | Gray, malleable. Ductile, Magnetic. | Soluble. | Infusible. |
| Magnetite, | Cube. | Parallel to the Octahedron. | Subconchoidal. | 4.9 to 5.1 | 5.5 to 6 | Metallic. | Black. | Black. Magnetic. | Soluble in hot HCl, but not in N. | Fuses with difficulty. |
| Franklinite, | Octahedron. | Parallel to the Octahedron. | Conchoidal. | 5.5 to 6.5 | 5 | Metallic. | Reddish brown. | Black. | Soluble in warm HCl. | Infusible, At a high heat, on charcoal, gives off Zn. |

| Name of the Species. | Primitive Form. | Cleavage. | Fracture. | Specific Gravity. | Hardness. | Luster. | Streak. | Colors and Physical Properties. | Action of Acids. | Blowpipe Characters. |
|----------------------|--------------------------------------|---|--------------------------|-------------------|------------|-------------------------------------|----------------------------------|--|---------------------------------|---|
| Hematite, | Rhombohedron of 86°10' | Indistinct parallel to the Rhombohedron and base. | Subconchoidal or uneven. | 4.5 to 5.3 | 5 to 6.5 | Metallic and splendid. | Bright red, or brownish red. | Steel gray or iron black. Sometimes magnetic. | Soluble when in powder, in HCl. | Infusible. In R.F. blackens and becomes magnetic. |
| Goethite, | Rt. Rhombic Prism of 94°52' | Parallel to the Brachy-Pinacoid. | Uneven or conchoidal. | 4 to 4.4 | 5 to 5.5 | Vitreous or imperfectly adamantine. | Brownish yellow or ochre yellow. | Yellow, red, or blackish brown. | Soluble in HCl. | Infusible. In R.F. Blackens and becomes magnetic. |
| Limonite, | Stalactitic, botryoidal, mammeloned. | | Fibrous or earthy. | 3.6 to 4 | 5 to 5.5 | Silky, submetallic and earthy. | Yellowish brown. | Dark brown. | Soluble in warm HCl. | Infusible. In R.F. Blackens and becomes magnetic. |
| Pyrrhotite, | Hexagonal Prism. | Parallel to the base. | Subconchoidal. | 4.4 to 4.7 | 3.5 to 4.5 | Metallic. | Dark grayish black. | Bronze yellow and copper red. Slightly magnetic. | Soluble in HCl and deposits S. | Gives off S and leaves a magnetic scoria. |
| Pyrite, | Cube. | Imperfect parallel to the Cube and Octahedron. | Conchoidal or uneven. | 4.8 to 5 | 6 to 6.5 | Metallic and glistening. | Brownish black. | Bronze yellow. | Soluble in N, but deposits S. | Gives off S and forms a magnetic globule. |
| Marcasite, | Rt. Rhombic Prism of 106°2' | Parallel to the Prism. | Uneven. | 4.6 to 4.8 | 6 to 6.5 | Metallic. | Grayish or brownish black. | Pale bronze yellow with a green or gray tint. | Soluble in N, but deposits S. | Gives off S and forms a magnetic globule. |
| Melante-rite, | Inclined Rhombic Prism of 82°21' | Parallel to the base. | Conchoidal. | 1.8 | 2 | Vitreous. | White. | Green or white. Becomes yellow on exposure. | Soluble in water. | Turns black and becomes magnetic. |
| Copiapite, | Hexagonal Prism. | Parallel to the base. | Earthy. | 2.14 | 1.5 | Pearly. | Yellow. | Yellow. | Soluble in water. | Loses color and becomes magnetic. |
| Vivianite, | Inclined Rhombic Prism of 111°12' | Parallel to the Clino-Pinacoid. | Uneven. | 2.6 | 1.5 to 2 | Pearly or vitreous | Bluish white. | Blue or green. | Soluble. | Decrepitates, loses color, fuses, becomes magnetic. |

| Name of the Species. | Primitive Form. | Cleavage. | Fracture. | Specific Gravity. | Hardness. | Luster. | Streak. | Colors and Physical Properties. | Action of Acids. | Blowpipe Characters. |
|----------------------|---|---|-------------|-------------------|------------|---------------------|---------------------------------|--|---|--|
| Leucopyrite, | Rt. Rhombic Prism of $111^{\circ}30'$. | Parallel to the base. | Uneven. | 7 to 8.7 | 5 to 5.5 | Metallic. | Grayish black. | Between steel gray and silver white. | Soluble and deposits As. | Gives off As and becomes magnetic. |
| Arsenopyrite, | Right Rhombic Prism of $111^{\circ}33'$. | Parallel to the Prism. | Uneven. | 6 to 6.4 | 5.5 to 6 | Metallic. | Dark grayish black. | Silver white. | Soluble, leaving a residue of S and As. | Gives off As and becomes magnetic. |
| Scorodite, | Rt. Rhombic Prism of $98^{\circ}2'$. | Imperfect parallel to the Macro-Pinacoid. | Uneven. | 3.1 to 3.3 | 3.5 to 4 | Vitreous. | White. | Pale green or brown. | Soluble in HCl. | Gives off As and becomes magnetic. |
| Pharmacosiderite, | Cube. | Imperfect parallel to the Cube. | Uneven. | 2.9 to 3 | 2.5 | Adamantine. | Green, brown, yellow. | Green, brown, red. Pyroelectric. | Soluble in HCl. | Gives off As, fuses and becomes magnetic. |
| Arseniosiderite, | Fibrous and concretionary. | | Earthy. | 3.5 | 1 to 2 | Silky. | Yellowish brown. | Yellow. | Soluble in hot HCl. | Fuses to a black enamel, and gives off As. |
| Siderite, | Rhombohedral of 107° . | Parallel to the Rhombohedron. | Uneven. | 3.7 to 3.9 | 3.5 to 4.5 | Vitreous or pearly. | White. | Gray, green, brown, red, white. | Dissolves in hot acids. | Infusible. Blackens and becomes magnetic. |
| Menaccanite, | Rhombohedral of $86^{\circ}3'$. | Parallel to the base. | Conchoidal. | 4.5 to 5 | 5 to 6 | Submetallic. | Metallic black to brownish red. | Iron black. Slightly magnetic. | Dissolves slowly and imperfectly. | Infusible in O. F. Slightly fusible in R. F. |
| Chromite, | Cube. | | Uneven. | 4.2 to 4.5 | 5.5 | Submetallic. | Brown. | Black. Slightly magnetic. | Insoluble. | Infusible. |
| Columbite, | Rt. Rhombic Prism of $100^{\circ}40'$. | Parallel to the Macro-Pinacoid. | Uneven. | 5.4 to 6.4 | 6 | Submetallic. | Dark red to black. | Iron or brown black. Often iridescent. | Insoluble. | Infusible. |

| Name of the Species. | Primitive Form. | Cleavage. | Fracture. | Specific Gravity. | Hardness. | Luster. | Streak. | Colors and Physical Properties. | Action of Acids. | Blowpipe Characters. |
|----------------------|--------------------------------|--|-------------|-------------------|-----------|---------------------|-----------------------------|--|---|---|
| Wolframite, | Rt. Rhombic Prism of 101°5' | Very easy parallel to the Macro-Pinacoid. | Uneven. | 7.1 to 7.5 | 5 to 5.5 | Submetallic. | Dark reddish brown. | Dark brownish, black. Sometimes slightly magnetic. | Decomposed by aqua regia. | Decrepitates and melts with difficulty to a magnetic globule. |
| Braunite, | Right Square Prism. | Parallel to the Octahedron. | Uneven. | 4.7 to 4.8 | 6 to 6.5 | Submetallic. | Dark brownish black. | Dark brownish, black. | With concentrated HCl gives off Cl. | Infusible. Reaction for Mn. |
| Hausmannite, | Right Square Prism. | Parallel to the base. | Uneven. | 4.7 | 5 to 5.5 | Submetallic. | Chestnut brown. | Brownish black. | With concentrated HCl gives off Cl. | Infusible. Reaction for Mn. |
| Pyrolusite, | Rt. Rhombic Prism of 93°40' | Parallel to the Prism and to Brachy-Pinacoid. | Uneven. | 4.8 to 4.9 | 2 to 2.5 | Metallic. | Black. | Iron black, dark steel gray, often bluish. | With concentrated HCl gives off Cl. | Infusible. Reaction for Mn. |
| Manganite, | Rt. Rhombic Prism of 99°40' | Parallel to the Macro-Pinacoid and the Prism. | Uneven. | 4.2 to 4.4 | 4 | Submetallic. | Reddish brown. | Dark steel gray or iron black. | Insoluble in N. in HCl gives off Cl. | Infusible. Reaction for Mn. Yields water. |
| Psilomelane | Massive and botryoidal. | | Uneven. | 3.7 to 4.3 | 5 to 6 | Submetallic. | Brownish black and shining. | Iron black or dark steel gray. | Soluble in HCl, and gives off Cl. | Yields water. Reaction for Mn. |
| Wad, | Reniform and amorphous masses. | | Uneven. | | 0.5 to 6. | Metallic or earthy. | Brown, shining. | Brown to gray. | Gives Cl with HCl. | Infusible. Reaction for Mn. |
| Alabandite, | Cube. | Parallel to the Cube. | Uneven. | 3.9 to 4 | 3.5 to 4 | Submetallic. | Green. | Iron black. Becomes brown on exposure. | Soluble and gives off H ₂ S. | Fusible. Reaction for Mn. |
| Triplite, | Rt. Rhombic Prism. | Three difficult and at right angles to each other. | Conchoidal. | 3.4 to 3.8 | 5 to 5.5 | Resinous. | Yellowish gray. | Brown. | Soluble. | Fusible. Reaction for Mn. |

| Name of the Species. | Primitive Form. | Cleavage. | Fracture. | Specific Gravity. | Hardness. | Luster. | Streak. | Colors and Physical Properties. | Action of Acids. | Blowpipe Characters. |
|----------------------|------------------------------------|---------------------------------|----------------------|-------------------|------------|---------------------|-----------------------|---|--|--|
| Rhodo-chro-site, | Rhomboidal of 106°51'. | Parallel to the Rhomboidal. | Uneven. | 3.4 to 3.6 | 3.5 to 4.5 | Vitreous or pearly. | White. | Rose. | Soluble in warm acids with effervescence. | Decrepitates, changes color and is infusible. Reaction for Mn. |
| Linnaeite, | Cube. | Imperfect parallel to the Cube. | Uneven. | 4.8 to 5 | 5.5 | Metallic. | Blackish gray. | Pale gray or copper red when tarnished. | Soluble in N. and deposits S. | Gives off sulphur and fuses. Reaction for Co. |
| Bieberite, | Inclined Rhombic Prism of 97°35'. | Fibrous or earthy. | Fibrous or earthy. | 1.92 | | Vitreous. | Reddish white. | Flesh and rose red. | Soluble in water. | Loses water and at a high heat gives off S. Reaction for Co. |
| Smaltite, | Cube. | Parallel to the Octahedron. | Granular and uneven. | 6.4 to 7 | 5.5 to 6 | Metallic. | Grayish black. | Tin white or steel gray. | Gives a pink solution in N. and deposits S and As. | Gives off As and melts to a brittle globule. Reaction for Co. |
| Cobaltite, | Cube. | Parallel to the Cube. | Uneven or lamellar. | 6 to 6.3 | 5.5 | Metallic. | Grayish black. | Silver white, with a violet tint, or gray. | Soluble in warm N. depositing As. | Gives off As and becomes magnetic. Reaction for Co. |
| Erythrite, | Inclined Rhombic Prism of 111°16'. | Parallel to the Rhombic Prism. | Uneven. | 2.9 to 2.5 | 1.5 to 2.5 | Vitreous or earthy. | Paler than the color. | Peach, crimson, red. Sometimes greenish gray. | Soluble. | Gives off As and fuses. Reaction for Co. |
| Heningtonite, | Incrustation. | Earthy. | Earthy. | | | Earthy. | Pale rose. | Rose. | Soluble with effervescence | Reaction for Co. |
| Millerite, | Rhomboidal of 144°8'. | Parallel to the Rhomboidal. | Uneven. | 5.2 to 5.6 | 3 to 3.5 | Metallic. | Bright. | Brass or bronze yellow. | Soluble in aqua regia. | Easily fusible to a brittle magnetic globule. Reaction for Ni. |
| Nicolite, | Hexagonal Prism. | Uneven. | Uneven. | 7.3 to 7.6 | 5 to 5.5 | Metallic. | Pale brownish, black. | Copper red. | Gives a green solution with aqua regia. | Fuses with odor of As. Reaction for Ni. |

| Name of the Species. | Primitive Form. | Cleavage. | Fracture. | Specific Gravity. | Hardness. | Luster. | Streak. | Colors and Physical Properties. | Action of Acids. | Blowpipe Characters. |
|----------------------|-----------------------------|---------------------------------------|-----------------------|-------------------|-----------|-------------------------|-------------------------|--|---|--|
| Ullmannite, | Cube. | Parallel to the faces of the Cube. | Granular. | 6.2 to 6.5 | 5 to 5.5 | Metallic. | Grayish black. | Steel gray. | Soluble in aqua regia. Gives a green color. | Gives off As and Sb. Fuses and gives a metallic globule. Reactions for Ni. |
| Annabergite, | Inclined Rhombic Prism. | | Uneven or earthy. | 3 to 3.1 | 2.5 to 3 | Silky. | Greenish white. | Apple green. | Soluble in N. H. Cl. | Gives off As and fuses. Reactions for Ni. |
| Zaratite, | Incrustation. | | Conchoidal. | 2.5 to 2.6 | 3 to 3.2 | Vitreous. | Fale emerald green. | Emerald green. | Soluble with effervescence | Gives a metallic globule of Ni. |
| Zincite, | Hexagonal Prism. | Parallel to the base. | Subconchoidal. | 5.4 to 5.8 | 4 to 4.5 | Vitreous. | Orange yellow. | Deep red. | Soluble. | Infusible. Reaction for Zn. |
| Sphalerite, | Cube. | Parallel to the Rhombic-Dodecahedron. | Conchoidal. | 3.9 to 4 | 3.5 to 4 | Resinous or adamantine. | White or reddish brown. | White, yellow, brown, black, red, green. | Soluble, and gives off H ₂ S. | Infusible. Reaction for Zn. |
| Goslarite, | Rt. Rhombic Prism of 90°42' | Parallel to the Macro-Pinacoid. | Conchoidal. | 1.9 to 2.1 | 2 to 2.5 | Vitreous. | White. | White, reddish, bluish. | Soluble in water. | Intumesces. Reaction for Zn. |
| Smithsonite, | Rhombohedron of 107°40' | Parallel to the Rhombic-hedron. | Uneven. | 4 to 4.4 | 5 | Vitreous or pearly. | White. | White, gray, green, brown. | Soluble with effervescence | Infusible. Reaction for Zn. |
| Hydrozincite, | Incrustation. | | Fibrous or earthy. | 3.5 to 3.6 | 2 to 2.5 | Dull. | Shining. | White, gray, yellow. | Soluble with effervescence | Infusible. Reaction for Zn. |
| Cassiterite, | Right Square Prism. | Imperfect parallel to the Prism. | Conchoidal or uneven. | 6.3 to 7.1 | 6 to 7 | Adamantine. | White, gray, brown. | Brown, black, red, gray, white, yellow. | Insoluble. | Infusible. Reaction for Sn. |

| Name of the Species. | Primitive Form. | Cleavage. | Fracture. | Specific Gravity. | Hardness. | Luster. | Streak. | Colors and Physical Properties. | Action of Acids. | Blowpipe Characters. |
|----------------------|------------------------------|---|--------------------------|-------------------|------------|-----------------------|------------------------------------|---|---|---|
| Stannite, | Right Square Prism? | | Uneven. | 4.3 to 4.5 | 4 | Metallic. | Black. | Steel gray, iron black, bluish, or yellowish. | Soluble in aqua regia, and deposits S. | Gives off S and melts to a scoria. |
| Rutile, | Right Square Prism. | Parallel to the Prism. | Subconchoidal or uneven. | 4.1 to 4.2 | 6 to 6.5 | Metallic, adamantine. | Pale brown. | Yellowish, brown, or red, black. | Insoluble. | Infusible. Reactions for Ti. |
| Octahedrite | Right Square Prism. | Parallel to the Octahedron and base. | Subconchoidal. | 3.8 to 3.9 | 5.5 to 6 | Metallic, adamantine. | Colorless. | Brown, blue, yellow. | Insoluble. | Infusible. Reactions for Ti. |
| Brookite, | Rt. Rhombic Prism of 99°50' | Parallel to the Prism. | Uneven. | 4.1 to 6 | 5.5 to 6 | Metallic, adamantine. | Colorless. | Brown, yellow, red, black. | Insoluble. | Infusible. Reactions for Ti. |
| Lead, | Cube. | | Hackly. | 11.4 | 1.5 | Metallic. | Shining. | Lead gray. | Soluble in N. | Fusible. |
| Minium, | Pulverulent. | | Earthy. | 4.6 | 2 to 3 | | Orange yellow. | Red. | Partly soluble in N. | Fusible. |
| Galenite, | Cube. | Parallel to the faces of the Cube. | Subconchoidal or uneven. | 7.2 to 7.7 | 2.5 to 2.7 | Metallic. | Lead gray, shining. | Lead gray. | Partly soluble in N. | Gives off S and fuses. |
| Bourbonite, | Rt. Rhombic Prism of 93°40' | Parallel to the Macro and Brachy Pinacoids. | Conchoidal or uneven. | 5.7 to 5.9 | 2.5 to 3 | Metallic. | Steel gray, lead gray, iron black. | Steel gray, lead gray, iron black. | Dissolved in N, giving a blue solution. | Decrepitates and fuses easily. Gives the reactions for S.Sb. Cu., & Pb. |
| Anglesite, | Rt. Rhombic Prism of 103°38' | Parallel to the Prism and base. | Conchoidal. | 6.2 | 2.7 to 3 | Adamantine. | Colorless. | White, tinged with yellow, blue, green. | Insoluble. | Decrepitates and fuses. |
| Clausthalite, | Cube. | Parallel to the faces of the Cube. | Granular. | 7 to 8.8 | 2.5 to 3 | Metallic. | Darker than the color. | Lead gray, bluish or red, dsh. | Partly soluble in N. | Gives the odor of Se, fuses and volatilizes. |

| Name of the Species. | Primitive Form. | Cleavage. | Fracture. | Specific Gravity. | Hardness. | Luster. | Streak. | Colors and Physical Properties. | Action of Acids. | Blowpipe Characters. |
|----------------------|----------------------------------|--|-----------------------------|-------------------|-----------|---------------------------------|-------------------------------------|-------------------------------------|----------------------------|---|
| Pyromorphite, | Hexagonal Prism. | Parallel to the Prism. | Subconchoidal. | 6.5 to 7 | 3.5 to 4 | Resinous. | White or yellowish. | Green, yellow, brown, blue. | Soluble. | Fusible. |
| Mimetite, | Hexagonal Prism. | Parallel to the faces of the Rhombohedron. | Imperfect or Subconchoidal. | 7.1 to 7.2 | 3.5 | Resinous. | White or yellowish. | White, yellow brown. | Soluble. | Gives off As and fuses. |
| Cerussite, | Rt. Rhombic Prism of 117°13' | Difficult parallel to the Prism. | Conchoidal. | 6.4 | 3 to 3.5 | Adamantine, vitreous or pearly. | Colorless. | White, gray, black, blue, green. | Soluble with effervescence | Decrepitates and fuses. |
| Crocoite, | Inclined Rhombic Prism of 98°44' | Parallel to the Prism. | Uneven. | 5.9 to 6.1 | 2.5 to 3 | Adamantine. | Orange yellow. | Bright red. | Soluble. | Blackens, decrepitates and fuses. |
| Stolzite, | Eight Square Prism. | Difficult parallel to the base. | Conchoidal. | 7.8 to 8.1 | 2.75 to 3 | Resinous. | Colorless. | Green yellow, gray, brown, red. | Soluble in N. H. ... | Fusible. |
| Wulfenite, | Right Square Prism. | Parallel to the Octahedron. | Subconchoidal. | 6.3 to 6.9 | 2.7 to 3 | Resinous. | White. | Yellow, green, gray, white, brown. | Decomposed. | Decrepitates and Fuses. |
| Bismuth, | Rhombic-hedron of 87°40' | Parallel to the base. | Indistinct. | 9.7 | 2 to 2.5 | Metallic. | Reddish silver white. | Reddish, silver white. | Soluble. | Volatilizes, leaving a yellow coating. |
| Bismuthinite, | Rt. Rhombic Prism of 91°30' | Parallel to the Brachy-Pinacoid. | Conchoidal. | 6.4 to 6.5 | 2 to 2.5 | Metallic. | Lead gray with a yellowish tarnish. | Lead gray with a yellowish tarnish. | Soluble. | Fuses in the flame of a candle, and is volatilized. |
| Aikinite, | Rt. Rhombic Prism of 110° | | Conchoidal or uneven. | 6.1 to 6.8 | 2 to 2.5 | Metallic. | Lead gray with a red tarnish. | Lead gray, with a red tarnish. | Partly soluble. | Gives off S and volatilizes. |

| Name of the Species. | Primitive Form. | Cleavage. | Fracture. | Specific Gravity. | Hardness. | Luster. | Streak. | Colors and Physical Properties. | Action of Acids. | Blowpipe Characters. |
|----------------------|---|----------------------------------|-----------------------|-------------------|-----------|-----------------------|-------------|---|--------------------------------|-----------------------------------|
| Tetradymite, | Rhombohedron of $81^{\circ}2'$ | Parallel to the base. | Uneven. | 7.2 to 8.4 | 1.5 to 2 | Metallic. | Steel gray. | Steel gray. | Soluble and deposits S. | Easily fusible. |
| Arsenic, | Rhombohedron of $83^{\circ}41'$ | Parallel to the base. | Uneven or granular. | 5.9 | 3.5 | Submetallic. | Tin white. | Tin white, tarnishes to gray. | With N, As is deposited. | Volatilizes. |
| Arsenolite, | Cube. | | Conchoidal. | 3.6 | 1.5 | Vitreous or silky. | White. | White or yellowish. | Slightly soluble in hot water. | Volatilizes. |
| Realgar, | Inclined Rhombic Prism of $74^{\circ}26'$ | Parallel to the base. | Conchoidal or uneven. | 3.4 to 3.6 | 1.5 to 2 | Resinous. | Red. | Red and orange yellow. | Partly soluble in aqua regia. | Fuses and volatilizes. |
| Orpiment, | Rt Rhombic Prism of $100^{\circ}40'$ | Parallel to the Brachy-Pinacoid. | | 3.4 | 1.5 to 2 | Pearly or resinous. | Yellow. | Yellow. | Soluble in aqua regia. | Fuses and volatilizes. |
| Antimony, | Rhombohedron of $87^{\circ}35'$ | Parallel to the base. | | 6.6 to 6.7 | 3 to 3.5 | Metallic. | Tin white. | Tin white. | Soluble in aqua regia. | Fuses and volatilizes. |
| Senarmonite, | Octahedron. | Parallel to the Octahedron. | Conchoidal. | 5.2 to 5.3 | 2 to 2.5 | Resinous. | White. | Grayish white. | Soluble in HCl. | Fuses and is volatilized. |
| Valentinite, | Rt. Rhombic Prism of $136^{\circ}58'$ | Parallel to the Prism. | | 5.5 | 2.5 to 3 | Adamantine or pearly. | White. | White, red or brown. | Soluble in aqua regia. | Fuses and is volatilized. |
| Stibnite, | Right Rhombic Prism of $90^{\circ}45'$ | Parallel to the Brachy-Pinacoid. | Subconchoidal. | 4.5 to 4.6 | 2 | Metallic. | Lead gray. | Lead gray and blackish. Sometimes iridescent. | Soluble. | Fusible in the flame of a candle. |

| Name of the Species. | Primitive Form. | Cleavage. | Fracture. | Specific Gravity. | Hardness. | Luster. | Streak. | Colors and Physical Properties. | Action of Acids. | Blowpipe Characters. |
|----------------------|------------------------------------|--|-----------------------|-------------------|-----------|-------------------------|---|---------------------------------|----------------------------------|---|
| Kermesite, | Inclined Rhombic Prism. | Parallel to the base. | | 4.5 to 4.6 | 1 to 1.5 | Adamantine or metallic. | Brownish red. | Cherry red. | Soluble in HCl. | Fuses and is volatilized. |
| Uraninite, | Cube. | | Conchoidal or uneven. | 6.4 | 5.5 | Submetallic. | Brown, green, shining. | Gray, green, brown, black. | Gives a yellow solution with N. | Infusible. |
| Autunite, | Rt. Rhombic Prism. | Parallel to the base. | | 3.0 to 3.1 | 2 to 2.5 | Pearly or vitreous. | Yellow. | Sulphur yellow. | Gives a yellow solution with N. | Fusible. |
| Torbernite, | Rt. Rhombic Prism. | Parallel to the base. | | 3.5 to 3.6 | 2 to 2.5 | Pearly or vitreous. | Green. | Green. | Gives a yellow solution with N. | Fusible. |
| Molybdate, | Inclined Rhombic Prism of 136° 48' | | Earthy. | | -1 | Dull or earthy. | Yellow. | Yellow. | Soluble in HCl. | Fusible. |
| Molybdenite, | Hexagonal Prism. γ | Parallel to the base. | | 4.4 to 4.8 | 1 to 1.5 | Metallic. | Lead gray; or greenish on grazed porcelain. | Lead gray. | Soluble in N, leaving a residue. | Infusible. |
| Copper, | Cube. | | Hackly. | 8.9 | 2.5 to 3 | Metallic. | Metallic, shining. | Red. | Soluble. | Fusible. |
| Cuprite, | Octahedron. | Parallel to the faces of the Octahedron. | Conchoidal or uneven. | 5.8 to 6 | 3.5 to 4 | Adamantine, earthy | Brownish red, shining. | Red. | Soluble. | Infusible. |
| Chalcoite, | Rt. Rhombic Prism of 119° 35' | Parallel to the Brachy-Dome. | Conchoidal. | 5.5 to 5.8 | 2.5 to 3 | Metallic. | Blackish gray and shining. | Blackish gray and bluish. | Soluble and deposits S. | Gives off S, fuses and colors the flame blue. |

| Name of the Species. | Primitive Form. | Cleavage. | Fracture. | Specific Gravity. | Hardness. | Luster. | Streak. | Colors and Physical Properties. | Action of Acids. | Blowpipe Characters. |
|----------------------|-----------------------------------|--|--------------------------|-------------------|-----------|-------------------------|----------------------------------|---|----------------------|---|
| Bornite, | Cube. | Parallel to the Octahedron. | Conchoidal or uneven. | 4.4 to 5 | 3 | Metallic. | Pale grayish, black and shining. | Copper red & pinchbeck brown. Easily tarnishes. | Partly soluble in N. | Blackens, fuses, and gives a magnetic globule. |
| Chalcopyrite, | Right Square Prism. | Difficult parallel to the base. | Conchoidal or uneven. | 4.1 to 4.3 | 3.5 to 4 | Metallic. | Greenish, black or shining. | Brass yellow. | Soluble. | Fuses to a magnetic globule. Gives reactions for Cu. |
| Tennantite, | Octahedron. | Difficult parallel to the Rhombic Dodecahedron | Uneven. | 4.3 to 4.4 | 3.5 to 4 | Metallic. | Dark, reddish, gray. | Lead gray to iron black. | Soluble. | Decrepitates, gives off As. and Sb, and becomes magnetic. |
| Tetrahedrite, | Tetrahedron. | Traces parallel to the Octahedron. | Subconchoidal or uneven. | 4.5 to 5.1 | 3 to 4.5 | Metallic. | Same as color. | Steel gray to iron black. | Partly soluble. | Gives off As. and Sb, and fuses to a malleable globule. |
| Chalcocite, | Doubly inclined Rhomboidal Prism. | Parallel to the Prism. | Conchoidal. | 2.2 | 2.5 | Vitreous. | Colorless. | Sky blue. | Soluble in water. | Loses water, fuses, and gives a malleable globule. |
| Brochantite | Rt. Rhombic Prism of 104°10' | Parallel to the Macro-Doine. | Conchoidal. | 3.8 to 3.9 | 3.5 to 4 | Vitreous. | Paler than color. | Emerald or blackish green. | Soluble. | Fuses and gives a globule of copper. |
| Atacamite, | Rt. Rhombic Prism of 112°20' | Parallel to the Macro-Doine. | | 4 to 4.3 | 3 to 3.5 | Adamantine or vitreous. | Apple green. | Bright or dark green. | Soluble. | Colors the flame intense bluish-green. Gives off Cl. |
| Libethenite, | Rt. Rhombic Prism of 92°20' | Imperfect. | Subconchoidal or uneven. | 3.6 to 3.8 | 4 | Resinous. | Olive green. | Olive or blackish green. | Soluble. | Fusible to a partly malleable globule. |
| Olivinite, | Rt. Rhombic Prism of 92°30' | Parallel to the Prism. | Conchoidal or uneven. | 4.1 to 4.4 | 3 | Adamantine or vitreous. | Olive green or brown. | Light to dark green. | Soluble. | Gives fumes of As. and fuses. |

| Name of the Species. | Primitive Form. | Cleavage. | Fracture. | Specific Gravity. | Hardness. | Luster. | Streak. | Colors and Physical Properties. | Action of Acids. | Blowpipe Characters. |
|----------------------|------------------------------------|--------------------------------------|--------------------------|-------------------|------------|--------------------------------|----------------------|---------------------------------|----------------------------|--------------------------------------|
| Liroconite, | Inclined Rhombic Prism of 119° 20' | Parallel to the Prism. | Conchoidal or uneven. | 2.8 to 2.9 | 2 to 2.5 | Vitreous or resinous. | Sky blue or green. | Sky blue or green. | Soluble. | Loses color, gives off As and fuses. |
| Malachite, | Inclined Rhombic Prism of 108° 42' | Parallel to the base. | Subconchoidal or uneven. | 3.7 to 4 | 3.5 to 4 | Adamantine, vitreous or silky. | Light green. | Bright green. | Soluble with effervescence | Gives off water and fuses. |
| Azurite, | Inclined Rhombic Prism of 99° 32' | Parallel to the Brachy-Dome. | Conchoidal. | 3.5 to 3.8 | 3.5 to 4.2 | Vitreous or adamantine. | Light blue. | Different shades of blue. | Soluble with effervescence | Gives off water and fuses. |
| Mercury, | Cube. | | | 13.5 | -1 | Metallic. | | Tin white. | Soluble. | Volatilizes. |
| Cinnabar, | Rhombohedron of 92° 36' | Parallel to the Hexagonal Prism. | Conchoidal or uneven. | 8.9 | 2 to 2.5 | Metallic or adamantine. | Scarlet. | Red. | Soluble in aqua regia. | Volatilizes. |
| Calomel, | Right Square Prism. | Parallel to the Prism. | Conchoidal. | 6.4 | 1 to 2 | Adamantine. | White. | Yellowish gray or brown. | Soluble in aqua regia. | Volatilizes. |
| Silver, | Cube. | | Hackly. | 10.1 to 11.1 | 2.5 to 3 | Metallic. | Silver white. | Silver white. | Soluble. | Fusible. |
| Amalgam, | Cube. | Parallel to the Rhombic Dodecahedron | Conchoidal. | 10 to 14 | 3 to 3.5 | Metallic. | Silver white. | Silver white. | Soluble. | Gives off Hg. and fuses. |
| Argentite, | Cube. | Parallel to the Rhombic Dodecahedron | Uneven. | 7.1 to 7.3 | 2 to 2.5 | Metallic. | Lead, gray, shining. | Black or lead gray. | Soluble. | Gives off S, intrinseces and fuses. |
| Proustite, | Rhombohedron of 107° 43' | | Conchoidal. | 5.4 to 5.5 | 2 to 2.5 | Adamantine. | Red. | Red. | Partly soluble. | Gives off As and fuses. |

| Name of the species. | Primitive Form. | Cleavage. | Fracture. | Specific Gravity. | Hardness. | Luster. | Streak. | Colors and Physical Properties. | Action of Acids. | Blowpipe Characters. |
|----------------------|------------------------------|---|-----------------------|-------------------|-----------|-------------------------|-------------------------------|--|---|--|
| Stephanite, | Rt. Rhombic Prism of 115°39' | Parallel to the Macro-Pinacoid and Prism. | Uneven. | 6.2 | 2 to 2.5 | Metallic. | Iron black. | Iron black. | Partly soluble. | Gives off Sb. and fuses. |
| Pyargyrite | Rhombohedral of 108°42' | Parallel to the Rhombohedron. | Conchoidal. | 5.7 to 5.9 | 2 to 2.5 | Metallic or adamantine. | Red. | Black or dark red. | Partly soluble. | Gives off Sb. and fuses. |
| Polybasite, | Rt. Rhombic Prism. | Parallel to the base. | Uneven. | 6.2 | 2 to 3 | Metallic. | Iron black. | Iron black or cherry red. | Soluble. | Decrepitates and fuses giving off Sb & As. |
| Cerargyrite | Cube. | | Conchoidal or uneven. | 5.5 | 1 to 1.5 | Resinous or adamantine. | Shining. | Gray white, greenish or violet. Malleable. | Insoluble in nitric acid, soluble in ammonia. | Fuses in the flame of a candle. |
| Bromyrite, | Cube. | | Conchoidal or uneven. | 5.8 to 6 | 1 to 2 | Splendent. | Shining. | Yellow or green. Malleable. | Partly soluble in ammonia. | Easily fusible. |
| Embolite, | Cube. | | Conchoidal or uneven. | 5.3 to 5.8 | 1 to 1.5 | Resinous or adamantine. | Shining. | Green. Malleable. | Partly soluble in ammonia. | Easily fusible. |
| Iodyrite, | Hexagonal Prism. | Parallel to the base. | Conchoidal. | 5.5 | 1 to 1.5 | Resinous or adamantine. | Yellow, shining. | Yellow. | Soluble. | Fusible. |
| Gold, | Cube. | | Hackly. | 15. to 19.0 | 2.5 to 8 | Metallic. | Gold yellow. | Gold yellow. | Soluble in aqua regia. | Fusible. |
| Platinum, | Cube. | | Hackly. | 16 to 19 | 4 to 4.5 | Metallic. | Whitish, steel gray, shining. | Whitish steel gray. | Soluble in aqua regia. | Infusible. |
| Iridosmine, | Hexagonal Prism. | | Uneven. | 19 to 21 | 6 to 7 | Metallic. | Tin white. | Tin white. | Insoluble. | Infusible. |

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